



Preschoolers' Approaches to Learning and Family-school Connections During COVID-19: An Empirical Study Based on a Wuhan Sample

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Abstract

The concept, approaches to learning (ATL), is an important dimension of children's school readiness, which reflects children's enthusiasm and engagement in learning settings. Due to coronavirus disease 2019 (COVID-19), when preschools were shut down for months and children's social interactions were greatly limited, preschoolers' ATL might be negatively affected. However, strengthened family-school connections might have the potential to reduce the adverse effects of the pandemic. Based on a sample of 340 preschoolers from 30 classes of 6 preschools in Wuhan, China, we explored the association between family-preschool connections and preschoolers' ATL scores. The findings showed that the preschoolers' ATL were statistically and positively associated with parental attendance at the online parent-teacher meetings initiated by the preschools (standardized coefficient = 0.15). Policy implications regarding the enhancement of family-preschool connections are discussed.

Keywords Approaches to learning · Family-school connections · COVID-19 · Preschoolers · Wuhan

During the coronavirus disease 2019 (COVID-19) pandemic, many preschools were shut down. Preschoolers had to stay at home for months, facing the challenges of lacking regular educational resources, social interactions, and schooling practices. Meanwhile, limited childcare services might cause extra stress to parents in addition to the economic and mental anxieties brought on by the pandemic. Given the social and emotional challenges to families, preschoolers' development might be negatively impacted (Yoshikawa et al., 2020).

Specifically, children's approaches to learning (ATL) is a developmental domain that could be undermined by limited social interactions and less supportive learning environments during the pandemic.

The concept ATL is an umbrella term covering a broad set of motivations and behaviors that reflect children's enthusiasm and engagement in learning settings (Hyson, 2008). ATL was posited to be an important component of school readiness that could be closely related to children's early academic success and long-term developmental outcomes (Kagan et al., 1995). Previous studies demonstrated that ATL at the kindergarten level significantly predicted children's reading and math achievement as well as social competence in later grades (Li-Grining et al., 2010; McClelland et al., 2006; Razza et al., 2015; Stipek et al., 2010). Further, the primary influences affecting preschoolers' ATL were in their social environments: the practices and relationships in families and preschools played an influential role in facilitating or undermining the development of ATL (Hyson, 2008). Accordingly, the significant changes to families and schools caused by COVID-19 might limit preschoolers' opportunities for developing ATL.

However, children also can be resilient and adaptable if adults create a caring and safe environment for them (Masten, 2015). Strengthened family-school connections might

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be one of the factors that can reduce the adverse effects of the pandemic on young children. A body of research showed family-school connections were beneficial to children's developmental outcomes, especially children's academic achievement, such as reading and mathematics scores in primary and high schools (Fan & Chen, 2001; Ginsburg et al., 2010; Jeynes, 2005). Some studies also demonstrated parental home-based and school-based involvement were significant predictors of ATL indicators (Anthony & Ogg, 2019; Fantuzzo et al., 2004). In the context of a global pandemic, when interactions with parents are likely to be the primary living experiences for most preschoolers, family-school connections might serve as a facilitator to equip parents with childrearing and educational resources to help preschoolers cope with the pandemic. Understanding such a mechanism is particularly important as it may provide insights for families and preschools to develop strategies to support young children during the pandemic.

However, though a considerable amount of literature has recognized that family-school connections were beneficial for children's learning (Fan & Chen, 2001; Ginsburg et al., 2010; Jeynes, 2005), research on family-school connections and children's ATL is limited. Moreover, much of the ATL research focuses on children across primary schools or in later years of education, and fewer studies investigated ATL development among preschool-aged children. Given that ATL is a keystone not only for later academic achievement but also life-long learning (Hyson, 2008), it is critical to understand the role of family-school connections in protecting and promoting preschoolers' ATL, especially when in the context of a pandemic. To fill these gaps, the current study explored the association between family-school connections and preschoolers' ATL during COVID-19 using a sample from Wuhan, China, where preschools were closed over the course of a semester.

ATL as an Important Dimension of Child Development

As a critical component of children's school readiness, ATL first appeared as one dimension of early development and learning in the 2000 U.S. National Education Goals (Kagan et al., 1995). ATL captured a broad set of learning styles that reflected children's motivations and engagement in educational activities, such as enthusiasm and self-regulation behaviors (Hyson, 2008; Li-Grining et al., 2010). Sometimes different terms were used for ATL, but they all emphasized "not the *what* but the *how* of learning" (Hyson, 2008, p. 12). Given that children's ATL referred to individual characteristics and observable behaviors in learning activities (McWayne et al., 2004), teacher and parent reports of children's behaviors were often used to measure ATL.

An increasing number of studies have empirically demonstrated the beneficial role of children's ATL in their developmental outcomes, especially educational attainment. Measured by the Preschool Learning Behavior Scale (PLBS; which assessed competence motivation, attention/persistence, and attitude toward learning), preschoolers' ATL was positively associated with their early academic success (McWayne et al., 2004). Using the same measure, ATL at kindergarten entry significantly predicted children's reading and math school readiness (Vitiello et al., 2011). In addition, a study (Bustamante et al., 2017) used the Learning-to-Learn Scale (LTLS; which includes strategic planning, effectiveness motivation, interpersonal responsiveness in learning, vocal engagement in learning, sustained focus in learning, acceptance of novelty and risk, and group learning) to measure ATL and pointed out that young children's ATL was significantly associated with growth in science school readiness.

Furthermore, some longitudinal studies have indicated the long-term educational impacts of ATL. ATL in kindergarten was positively linked with gains in math achievement through the early elementary grades (DiPerna et al., 2007) in the Early Childhood Longitudinal Study-Kindergarten, where ATL was measured by the Teacher Social Rating Scale that contained organization, eagerness to learn, attentiveness, learning independence, persistence, adaptation to changes, and following the rules. Similar results were found for children's reading and math achievement from kindergarten to fifth grade (Li-Grining et al., 2010; Razza et al., 2015). Using the Cooper-Farran Behavioral Rating Scales to assess children's self-regulation, responsibility, independence, and cooperation, a study demonstrated the role of ATL in facilitating math achievement from kindergarten through second grade (McClelland et al., 2006).

As in the studies mentioned above, components of ATL vary in measures. However, ATL in the U.S. literature generally includes emotions (e.g., interest and motivation) and self-regulated behaviors (e.g., attention, attentiveness, persistence, creativity, and flexibility) (Hyson, 2008; Razza et al., 2015). Importantly, cultural influences permeate the definition of ATL as different cultures may emphasize different dimensions of ATL. For instance, Japanese parents were found to encourage children's persistence more than U.S. families (Hyson, 2008). In the Chinese context, some scholars proposed the following ATL dimensions: curiosity and interest, persistence, concentration, creation, and reflection (Cai, 2015; Yan & Wei, 2013).

Influences of ATL

Under the ecological perspective, factors that impact children's ATL development range from child characteristics to children's interaction with families and schools (Bronfenbrenner & Morris, 2006). Though children may have innate learning styles, the bulk of empirical research showed that many factors affect ATL development throughout early childhood (Hyson, 2008). First, neuroscience studies pointed out that the maturation of the brain was a key factor as deliberate cognitive processes were involved in performing ATL (Rothbart et al., 2007). Among preschoolers, older children had higher scores on indicators of ATL than the younger ones (Bell et al., 2013). Child gender might be another factor because preschool girls were found more attentive and persistent than boys (Buek, 2019; McWayne et al., 2004). In addition to child characteristics, children's relationship with their families, parenting styles and beliefs, family income, and parental education are also important factors in children's ATL development. Secure-attached children who had a high-quality relationship with their families were more likely to develop curiosity, enthusiasm, and persistence (Arend et al., 1979). Children from low-income families were at risk of poorer ATL performance, whereas children whose parents have higher education and more progressive parenting beliefs were found to have higher ATL scores (Buek, 2019; Burchinal et al., 2002). Furthermore, the relationships between children and teachers and preschool program quality might be important school influences. When teachers were warm and sensitive, children were found to be more active and engaged (Burchinal et al., 2002; Raspa et al., 2001). Children in higher-quality programs were more likely to be engaged and focused than their peers in lower-quality programs (Raspa et al., 2001).

Consistent evidence of the factors that affect children's ATL was found in Chinese studies. Older preschoolers and girls had higher scores on ATL indicators, especially on attention, persistence, and learning strategies (Feng, 2020). Among the family factors, socioeconomic status was a significant predictor for ATL at grade one (Wang et al., 2010). Setting family routines was shown to have a positive association with ATL (Li, 2011). Likewise, positive discipline was positively associated with preschoolers' competence motivation and learning strategies, but physical punishment behaviors were negatively related to competence motivation, attention/persistence, and learning strategies; similar results were found for authoritative parenting versus authoritarian parenting behaviors (Feng & Wu, 2018; Lin & Ye, 2020).

The Facilitator and Protector Role of Family-School Connections

The ecological perspective also points out the value of connections between family and school in creating a consistent and stimulating environment for young children to learn (Bronfenbrenner & Morris, 2006). Likewise, the perspective on resilience in children provides a framework for more capable adults to help children counterbalance significant challenges and adversities, such as the COVID-19 pandemic. Parents and teachers can provide influential and multifaced protections that enable children to cope with adversities brought on by the pandemic, as responsive and supportive relationships are commonly recognized as protective factors that buffer children from developmental disruption (Masten, 2015). Integrating the ecological and resilience perspectives highlights the importance of family-school connections. More channels and resources to enhance connections between parents and educators can better support children's learning and positive development (Kim & Sheridan, 2015).

One of the core features of family-school connections is to engage parents and schools to support children's learning collaboratively. The construct of family-school connection was also called other terms, such as parental or family involvement, as there were various dimensions for parents to get involved with children's school lives (Kim & Sheridan, 2015). In general, connections between families and schools can be categorized based on locations: home-based involvement (behaviors actively promote a learning environment at home), school-based involvement (activities that parents engage in at school to benefit their children), and home-school conferencing (communication between parents and school personnel about children's educational experiences) (Fantuzzo et al., 2004; Kim & Sheridan, 2015). Empirically, the beneficial role of family-school connections in children's development outcomes was commonly recognized by past studies; for instance, parental school-based involvement was positively associated with children's reading and mathematics outcomes in several meta-analyses (Fan & Chen, 2001; Ginsburg et al., 2010; Jeynes, 2005).

In China, the value of parents' role in promoting child development was also widely recognized (Lau et al., 2011), but the feature of family-school connections was that parents were more engaged in home-based involvement than school-based activities. Previous Chinese studies showed that home-based involvement had a more influential role than school-based involvement in children's school readiness (Lau et al., 2011). Chinese parents helped children's learning through home-based involvement such as parental instruction and homework involvement (Hu et al., 2020; Lau

et al., 2011); however, many parents were relatively inactive and passive in school-based involvement, believing that it was the teacher's responsibility to take care children's school activities (Hu et al., 2020; Ng, 1999). The primary form of contact between Chinese parents and teachers is through parent-teacher meetings, whereas other forms of contact, such as home and school visiting, texts, and emails, are less frequently used. Further, contact between parents and teachers may vary by school type. Specifically, private preschools might be more motivated to create a partnership with parents than public ones in China.

Note that in the context of COVID-19, when preschools were closed, the locations of parental involvement were mostly limited to the children's homes. Thereby we distinguished the dimensions of family-preschool connections in this study by defining whether the preschools or the parents initiated the activities. For example, parent-teacher meeting invitations sent by the teachers would be considered created by the preschools; parents actively contact teachers would be defined as activities initiated by the parents.

The Role of Family-School Connections on ATL

In general, research on family-school connections and preschoolers' ATL is underexplored in the U.S. and Chinese contexts. Several theoretical models were examined to show the potential role of parental involvement in fostering children's engagement and achievement motivation. The connections between parents and the schools can exert influence on children's engagement and motivation through building reciprocal relationships, facilitating parental involvement in learning practices, affecting parenting styles and beliefs, transmitting educational values, and constructing social capital (Bempechat & Shernoff, 2012; Hyson, 2008).

Empirically, Fantuzzo et al. (2004) found significant, positive associations between family involvement and preschooler's ATL. The dimensions of competence motivation, attention, and learning attitudes were positively associated with home-based, school-based involvements and home-school conferencing. But the positive associations only existed for home-based activities when in the presence of school-based activities and home-school conferencing. In addition, Anthony and Ogg (2019) conducted a longitudinal analysis involving analyses on family-school connections and ATL from kindergarten through the third grade, but they found a weaker relation between family involvement and children's ATL development. The association between school-based involvement and ATL scores was consistent with Fantuzzo et al. (2004). However, no significant associations were identified for home-based involvement and home-school conferencing with school-aged children's ATL

(Anthony & Ogg, 2019). Anthony and Ogg (2019) proposed that (1) the home-based activities measured in their study may matter more directly for academic achievement than ATL, and (2) students with difficulties may have had more home-school conferencing activities, which might offset the positive effects of family-school communications. Besides, some Chinese studies suggested that the home learning environment was a significant predictor for young children's ATL indicators (Feng, 2020; Suo & Wang, 2020).

Current Study

In January 2020, the central government of China imposed a lockdown in Wuhan as an urgent response to the outbreak of COVID-19. Strict guidelines were followed to implement travel bans, gathering restrictions, workplace hazard controls, and facility closures. In an effort to stop the spread of the virus, schools were also closed. The Wuhan lockdown was lifted in April 2020, but the closure of preschools remained for a longer time. Many Wuhan preschools reopened and resumed in-person activities until September 2020. The preschool shutdown in Wuhan was much longer and more strict than in other counties such as the United States, Sweden, and Norway (Pramling Samuelsson et al., 2020). During the over-one-semester preschool shutdown, home-schooling became the option for many parents, some of which provided online learning to their children (Dong et al., 2020).

Previous studies pointed out the significance of ATL as a foundation for healthy child development (Li-Grining et al., 2010; McClelland et al., 2006; Razza et al., 2015; Stipek et al., 2010) and the positive link between family-school connections and children's academic achievement (Fan & Chen, 2001; Ginsburg et al., 2010; Jeynes, 2005). However, the relations between family-school connections and preschoolers' ATL remains underexplored. Further understandings of such relations are important, and studies in the pandemic context are particularly meaningful in providing additional insights for parents, preschools, teachers, and policymakers to protect children against stressful adversities. To fill these gaps, we collected data from a sample of preschoolers and their families in Wuhan, China. We aimed to explore the association between preschoolers' ATL scores and the family-school connections during a period when schools were shut down due to the pandemic.

Table 1 Sample characteristics

Variable		Obs	Mean	Std. Dev	Min	Max
Background information (covariates)	Girl	340	0.459	0.499	0	1
	Age (months)	340	65.409	9.441	40	90
	Birth order	340	1.806	1.179	1	4
	Ethnic minorities	340	0.026	0.161	0	1
	Parents' marital status: Married	340	0.932	0.252	0	1
	Highest education of the mother	340	3.712	1.200	1	8
	Level of family income	340	13.603	7.663	1	24
	Parents lost job due to COVID-19	340	0.038	0.192	0	1
	<i>Daban</i> : preschool grade for 5–6	340	0.479	0.500	0	1
	Online course attendance	340	0.574	0.495	0	1
Outcome variable	Public preschool	340	0.729	0.445	0	1
Outcome variable	ATL scores	340	14.203	3.044	6	24
Main explanatory variables	Frequency of PT meeting attendance	340	0.968	1.138	0	4
	Frequency of PT meeting invitation	337	1.056	1.147	0	4
	Degree of FP contacts	317	−0.033	0.914	−1.219	3.664
	Quality of FP contacts	327	−0.039	0.957	−2.380	1.470

Data and Method

Data Source

Data for this study came from a collaborative survey project between researchers in Hong Kong and Wuhan, which aimed to understand the impacts of COVID-19 on preschoolers and their families. Convenience sampling with a focus of diversity was used, and six preschools were recruited. Three of the preschools were public and the rest were private, similar to the distribution of preschool types in Wuhan (Wuhan Education Bureau, 2021). From mid-June to early July of 2020, when the pandemic in Wuhan was about to end, we asked parents whose children were in the six preschools to fill out a questionnaire. The children were either in the 4- to 5-year-olds group (the second grade in preschool) or the 5- to 6-year-olds group (the third grade in preschool). The questionnaires were mailed to parents or delivered by preschool teachers during home-visits. We received 453 questionnaires out of 600 that were sent out, and 392 had valid information on the children's ATL. Among the 392 questionnaires, 340 (86.73%) contained complete data on the primary measure of family preschool connection in this study (i.e., the frequency of parental attendance at the teacher-parent online meeting). We conducted the analyses using the 340 questionnaires.

Measures

Firstly, children's ATL was measured by a scale with five dimensions (curiosity and interest, persistence, concentration, reflection, and creation) based on two Chinese studies

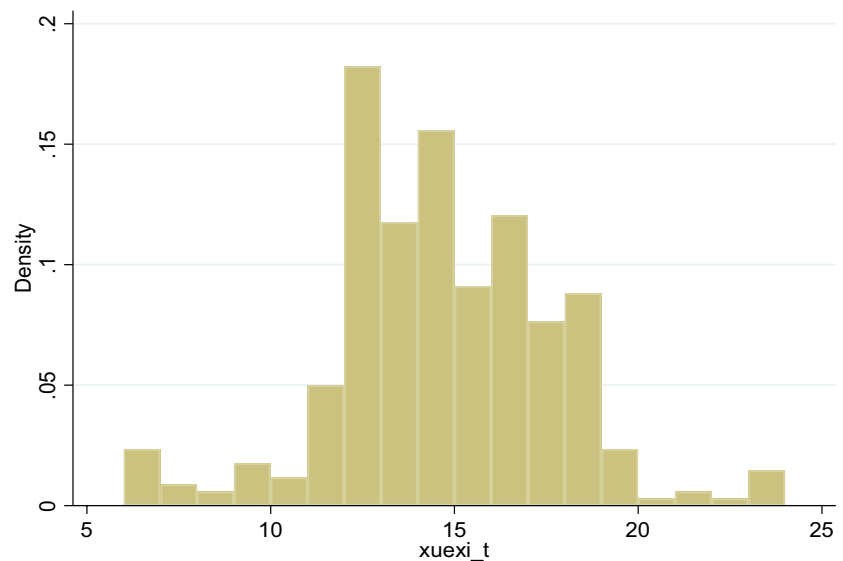
(Cai, 2015; Yan & Wei, 2013). It includes six items regarding whether the child will take the initiative to approach new things, finish a specific task persistently, focus on his/her work in a noisy environment, recognize mistakes and explain the reasons, express his/her own ideas and opinions in various ways, and make his/her own toys. Secondly, our study included several measures of family-preschool connections. The first one was the frequency of parental attendance to online parent-teacher (PT) meetings when preschools were closed, measured by a 0–4 scale (0 = none, 1 = once or twice in total, 2 = about once a month, 3 = about once a week; 4 = more than once a week). We also collected the frequency of teachers inviting parents to attend online PT meetings using a similar scale. Additionally, the parents rated eight statements regarding the frequency and six statements regarding the quality of family-preschool (FP) contact, and we constructed two indicators using factor analysis, one for the frequency and one for the FP quality. Moreover, based on previous studies, several covariates were used in the analyses, which included child gender, child age (months), birth order, ethnicity status, parents' marital status, family income levels, mothers' educational level, whether the child is in "daban" (i.e., the preschool grade for children aged 5–6 in China) and preschool type (public or private). Two other factors related to the pandemic were also incorporated: whether parents lost jobs due to COVID-19 and children's online course attendance.

Sample Characteristics

As shown in Table 1, 45.9% of the sample were girls, similar to the gender distribution in China. On average, the children

Fig. 1 The distribution of ATL scores

The distribution of ATL scores



were about 65 months old (approximately 5.4 years old). Some children were older than six as they (1) chose to postpone their entrance to primary schools, or (2) were over three when they entered the preschool due to development delays or because of the cut-off birth date requirement to enter public preschools (September 1st in Wuhan). Most children were either the first or second child of the family (about 80.0%). Around 3.8% of the family experienced job loss due to COVID-19. About 57.4% of the children attended certain forms of online courses, most of which were provided by the preschool, and some were purchased from private tutoring online institutes. The approaches to learning measure items were added as an ATL total score, ranging from 0 to 24. The distribution of the ATL total score in the sample was close to a normal distribution with a mean of 14.203 and a standard deviation of 3.044 (Fig. 1).

Estimation Method

The primary estimation method of this study was the sequential OLS regression process. We first conducted the baseline model (M1), which included most of the covariates except for the preschool type. We then added the preschool type to the baseline model as the main model (M2). Lastly, we added preschool fixed effects (binary variables of classes) to the second model (M3). Besides, considering the nature of the nested data (children nested in classes) in our sample (Rabe-Hesketh & Skrondal, 2008; Raudenbush & Bryk, 2002), we established a two-level mixed model (M4) using the “xtmixed” command in STATA 14 (Cappella et al., 2015; Lleras & Rangel, 2009). However, the intra-class correlation coefficient (ICC) of the two-level mixed model was very

low (around 0), and the LR test vs. Linear model test indicated that the model was more likely to be linear. Thereby we decided to focus on the OLS results and use the two-level mixed model as a robustness check. Lastly, we used the standardized coefficient as the effect size of continuous variables and Cohen’s *d* as the effect size of binary variables.

Results

Main Results

As shown in Table 2, in the baseline model (M1), there was a positive and statistically significant association between the frequency of online PT meeting attendance and children’s ATL ($b=0.401$, $p=0.013$) at the 5% significance level. Note that studies regarding ATL were not consistent in adding school level controls (Anthony & Ogg, 2019; Fantuzzo et al., 2004; Li-Grining et al., 2010) and we decided to add preschool type to control for any possible differences between schools. In the main model adding the binary variable of preschool type (M2), the coefficient was very close to that in the baseline model. This result was also similar to the class fixed effect model (M3). Overall, the standardized coefficient of PT meeting attendance frequency was around 0.15, which means that a one standard deviation increase in the frequency of parental PT meeting attendance would be associated with a 0.15 standard deviation increase in the ATL score, all else equal. In addition, sensitivity analyses using multiple techniques to deal with missing data (replacing the missing value with variable mode for all the covariates,

Table 2 Regression results for the OLS models and mixed-effects model

Variables	<i>OLS (M1)</i>	<i>OLS (M2)</i>		<i>OLS (M3)</i>	<i>Mixed-effects model: 2 level</i>
	Original coefficients	Original coefficients	Standardized coefficients	Original coefficients	Original coefficients
Frequency of online PT meeting attendance	0.401** (0.161)	0.401** (0.161)	0.150	0.362** (0.175)	0.401*** (0.146)
Girl	0.061 (0.347)	0.067 (0.347)	0.011	0.137 (0.373)	0.067 (0.300)
Age measured in months	0.048* (0.026)	0.051* (0.029)	0.159	0.067* (0.036)	0.051** (0.022)
Birth order	-0.205 (0.155)	-0.203 (0.156)	-0.079	-0.092 (0.173)	-0.203 (0.149)
Minority	-0.194 (1.330)	-0.178 (1.329)	-0.009	0.37 (1.448)	-0.178 (1.667)
Parents' marital status: Married	0.158 (0.504)	0.143 (0.508)	0.012	0.0644 (0.519)	0.143 (0.519)
Highest education of mother	0.056 (0.149)	0.056 (0.149)	0.022	0.021 (0.175)	0.056 (0.120)
Level of family income	0.072*** (0.026)	0.071*** (0.026)	0.179	0.081*** (0.029)	0.071*** (0.023)
Parent lost job because of COVID-19	0.869 (0.729)	0.851 (0.733)	0.054	0.963 (0.752)	0.851 (0.745)
<i>Daban</i> : class group aged 5–6	-0.848* (0.440)	-0.879* (0.470)	-0.144	-0.593 (0.699)	-0.879** (0.410)
Online course attendance	0.475 (0.334)	0.469 (0.330)	0.076	0.474 (0.390)	0.469 (0.364)
Public preschool	NA	-0.089 (0.377)	-0.013	NA	-0.089 (0.379)
Constant	9.771*** (1.918)	9.688*** (1.969)	NA	6.667** (2.620)	9.688*** (1.814)
N	340	340		340	340
R-squared	0.082	0.082		0.137	NA
Number of groups	NA	NA		NA	30

Robust standard errors in parentheses. The standardized coefficients reflect the standard deviation change of y divided by the standard deviation change of x for a continuous independent variable. They were obtained by using the “beta” option in the regression command of STATA

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

multiple imputation, and exclusion of possible outliers) showed that the above results were robust.

Results for Alternative Measures of Family-Preschool Connections

We used alternative measures for the frequency of online PT meeting attendance; results are shown in Table 3. First, we created a binary variable on whether parents attend any PT meetings (M5), adding the same covariates as in the main model (M2). Results indicated that children whose

parents attended PT meetings had somewhat higher ATL scores than those whose parents did not participate in the meeting (Cohen’s $d = 0.15$) but the effect is not statistically significant ($p > 0.1$). Second, we generated binary variables for each category of the parental PT meeting frequency, and used the none as the reference group (M6). As shown in the third column of Table 3, compared to zero attendance, only the highest parent-teacher meetings frequency had a statistically significant¹ positive association with children’s ATL

¹ Given the p-value is very close to 0.05, we consider it to be statistically significant at the 5% significance level.

Table 3 Regression results for the alternative measures of family-preschool connections

	M2	M5	M6	M7	M8	M9
Frequency of online PT meeting attendance	0.401** (0.161)					
Whether attended any online PT meetings		0.469 (0.332)				
PT meetings: once to twice in total			0.100 (0.383)			
PT meetings: about once per month			0.480 (0.561)			
PT meetings: about once per week			1.074 (0.699)			
PT meetings: more than once per week			1.984** (1.017)			
Frequency of online PT meeting invitation				0.350** (0.163)		
Degree of FP contacts					0.369** (0.187)	
Quality of FP contacts						0.380* (0.197)
Controls	YES	YES	YES	YES	YES	YES
N	340	340	340	340	317	333
R-squared	0.082	0.066	0.085	0.077	0.088	0.086

(1) The reference group for the frequency dummies is “0 attendance”. (2) The other controls in all the OLS models in this table are the same, as listed in the main OLS model (M2) in Table 2

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

scores ($p = 0.052$), and this effect size of parents participating in PT meetings more than once per week was around 0.66 in terms of Cohen’s d , larger than the effect size in the main model. In addition, when the outcome became the frequency of teachers inviting parents to PT meetings (M7), the effect was also statistically significant ($p = 0.033$) at the 5% level and the standardized coefficient was 0.13, smaller than the one in the main model (M2). Also note that the degree of FP contacts (M8) exhibited significant positive associations with children’s ATL scores ($p = 0.050$), and a similar result was found for the quality of FP contacts (M9), though its coefficient was considered marginally significant at the 10% level ($p = 0.055$).

Sub-Sample Analyses

We also conducted some sub-sample analyses. We checked the interaction effect for children whose parents’ jobs were affected by COVID-19 and did not find significant results. The difference in effects between low-income families and other families was not statistically significant either, and we did not find a significant difference in impacts for boys and girls.

Discussion

ATL was recognized as an important dimension for school readiness, emphasizing children’s methods and styles of learning (Kagan et al., 1995), which were shown to be keystones for later academic attainments and long-term learning outcomes (Li-Grining et al., 2010; McClelland et al., 2006; Razza et al., 2015; Stipek et al., 2010). The relationships and practices in families and preschools were influential factors to children’s ATL development (Hyson, 2008), and adversities in a pandemic that negatively affected families and schools might undermine children’s ATL. However, children can be resilient and adaptable when adults provide a supportive and caring environment (Masten, 2015). Previous research has recognized the beneficial role of family-school connections in school-aged children’s academic achievement (Fan & Chen, 2001; Ginsburg et al., 2010; Jeynes, 2005), and a few studies demonstrated such positive associations specifically to children’s ATL (Anthony & Ogg, 2019; Fantuzzo et al., 2004). Nevertheless, the relation between family-school connections and preschool-aged children’s ATL remains underexplored. To further understand such mechanisms, especially in a pandemic context, we collected data on a sample of preschoolers and their parents from Wuhan, China, where preschools were closed for a long time.

Overall, we found the frequency of parental attendance at online parent-teacher meetings during the period of school shutdown was positively associated with preschoolers' ATL scores. The results were consistent with the positive effects of parental involvement found in Fantuzzo et al. (2004) and Anthony and Ogg (2019). Specifically, a higher frequency of parental attendance at online parent-teacher meetings was associated with higher ATL scores among children (effect size in the form of standardized coefficient = 0.15) when preschools were closed in Wuhan, China. Furthermore, the comparison between parents with a high frequency of attendance at the parent-teacher meetings (more than once per week) and parents not participating in any parent-teacher meetings during the preschool shutdown period showed the largest effect size, around 0.66 in the form of Cohen's *d*. At the same time, the frequency of invitations to parent-teacher meetings initiated by preschool teachers was also found to be positively related to children's ATL scores; however, the effect size was smaller than that of parents' actual attendance of the meetings. Lastly, the degree and quality of parent-teacher contacts also mattered for children's ATL, though the latter was marginally significant.

Our results indicate the beneficial role of family-school connections in preschoolers' ATL development during a pandemic, especially in the form of parental attendance to online parent-teacher meetings. Moreover, the high frequency of parents attending parent-teacher meetings might be a critical condition for family-school connections to support preschoolers' ATL, which had the largest effect size in our results. It is also worth noting that compared to teachers inviting parents to parent-teacher meetings, actual parental attendance at these meetings may matter more. The results highlight the importance of efforts to provide flexible and accessible opportunities for families and preschools to build connections. It might be more feasible for parents to attend online parent-teacher meetings and connect with preschools during the pandemic. Preschools and teachers should prepare and initiate more parent-teacher meetings, and more importantly, parents should have more access and be encouraged to attend such meetings.

Strengths and Limitations

Admittedly, there are some limitations of the study. One is that we used convenience sampling to recruit participants, which might affect the generalization of the findings. Another limitation is that we do not have information on the connections between families and preschools and children's ATL before the pandemic to detect potential causal inferences. We cannot exclude the possibility that parents who participated actively in parent-teacher meetings were more engaged in promoting children's ATL. In addition, this study

lacks multiple sources of data collection to understand the mechanism of family-school connections in affecting children's ATL development. Some channels might be building reciprocal relationships, informing parental practices, and influencing parenting styles and beliefs (Bempechat & Shernoff, 2012; Hyson, 2008). Future research should collect information on more forms of family-school contacts and parenting behaviors to better understand the working mechanisms of family-school connections. Further, to facilitate effective communication between families and preschools, more research is needed to understand the challenges for parents, e.g., different cultural beliefs on childrearing and less flexible working schedules, to ensure accessible and equitable family-school connections.

Nevertheless, the current study provides valuable information on children's learning based on a sample from Wuhan, China, where a severe pandemic outbreak occurred, and stringent guidelines were implemented to prevent the spread of the disease. The study also contributes to the enrichment of the literature for family-school connections and preschoolers' ATL development, and provides insights for preschools, parents, and policy stakeholders to protect children's learning against the adversities and anxieties in a stressful context.

Conclusion

To summarize, our results highlight the benefits of parental attendance at online parent-teacher meetings on preschool-aged children's ATL, especially when parents participate in such meetings at a high frequency. During a pandemic when children's social interactions and school activities might be greatly limited, our findings suggest that policy and practices that provide accessible opportunities to strengthen the connections between parents and preschools might be of particular importance for promoting children's learning.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s10643-021-01217-x>.

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